

Schedule A
to the Response the Office Action of October 6, 2006

Please amend the Claims of the specification to read as follows:

Claims 1-13 (Cancelled)

14. (Withdrawn) A tubular baseball bat with a longitudinal axis comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall with a sweet spot area within its length, and a tapered bridging portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;
- b) a proximal end where the tapered portion connects to the handle portion;
- c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweet spot area;
- d) two lateral regions extending on either sides of the mid-section towards the distal and proximal ends respectively, and
- e) a radial stiffness for the barrel wall at each location along the length of the barrel portion,

the radial stiffness of the barrel wall being greater in the mid-section of the barrel portion than in the two lateral regions of the barrel portion

to provide a flattened batting performance over the mid-section that is flattened compared to what otherwise would exist without the presence of the greater radial stiffness in the mid-section and which is characteristic of an enlarged sweet spot.

15. (Withdrawn) A bat as in Claim 14 wherein the barrel portion comprises a barrel wall of polymer composite material and the polymer composite material provides a radial stiffness in the barrel wall within the mid-section of the barrel portion which is greater than the radial stiffness of the barrel wall within the lateral regions.

16. (Withdrawn) A bat as in Claim 15 wherein the polymer composite material contains reinforcing fibers and the reinforcing fibers are angled within the barrel wall of the mid-section to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion.

17. (Withdrawn) A bat as in Claim 15 wherein the polymer composite material contains reinforcing fibers at various angles with respect to the longitudinal axis, the reinforcing fibers present within the barrel wall of the mid-section being at a higher average angle from the longitudinal axis than the average angle of the fibers within the barrel wall of the two lateral regions of the barrel portion.

18. (Withdrawn) A bat as in Claim 15 wherein the polymer composite material contains reinforcing fibers of types having differing stiffnesses, and the reinforcing fibers within the barrel wall of the mid-section contain a higher percentage of fibers of higher stiffness than in the lateral regions to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion.

19. (Withdrawn) A bat as in Claim 15 wherein the barrel wall has a thickness and wherein the polymer composite material of the barrel wall is of a greater thickness within the barrel wall of the mid-section than in the lateral regions by at least $8\frac{1}{3}\%$ to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion.

20. (Withdrawn) A bat as in Claim 14 wherein the barrel wall has a thickness and the thickness of the barrel wall in the mid-section is greater than the thickness of the barrel wall in the lateral regions by at least $8\frac{1}{3}\%$ whereby the radial stiffness of the barrel wall in the mid-section of the barrel portion is greater than the radial stiffness of the barrel wall in the lateral regions.

21. (Withdrawn) A bat as in Claim 20 wherein the thickness of the mid-section of the barrel portion is greater than the thickness of the lateral regions at their thinnest parts by at least 5%.

22. (Withdrawn) A bat as in Claim 14 wherein the barrel portion has inner and outer surfaces, the barrel portion comprising a stiffener positioned along the mid-section of the barrel portion

adjacent the inner or outer surface of the barrel portion, whereby the radial stiffness of the barrel wall with the stiffener present along the mid-section of the barrel portion is greater than the radial stiffness of the barrel wall in the lateral regions.

23. (Withdrawn) A bat as in Claim 22 wherein the stiffener has a stiffener wall having a thickness of between .005 inches 0.040 inches.

24. (Withdrawn) A bat as in Claim 22 wherein the stiffener has a length of 2 to 6 inches.

25. (Withdrawn) A bat as in Claim 22 wherein the stiffener is unbonded along its length to the barrel portion.

26. (Withdrawn) A bat as in Claim 22 wherein the stiffener is bonded at least partially along its length to the barrel portion.

27. (Withdrawn) A bat as in Claim 22 wherein the stiffener is bonded fully along its length to the barrel portion.

28. (Withdrawn) A bat as in any one of Claims 22, 23, 24, 25, 26 or 27 wherein the stiffener is located on the inner surface of the barrel portion.

29. (Withdrawn) A bat as in any one of Claims 22, 23, 24, 25, 26 or 27 wherein the stiffener is located on the external surface of the barrel portion.

30. (Withdrawn) A bat as in any one of Claims 22, 23, 24, 25, 26 or 27 wherein the stiffener is composed of polymer composite material which comprises a resin matrix encapsulating reinforcement fibers wherein the resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein the reinforcement fibers are selected from the group consisting of fiberglass, graphite, carbon, aramid, boron, nylon fibers and mixtures thereof.

31. (Canceled)

32. (Canceled)

33. (Withdrawn) A bat as in any one of Claims 14, 15, 16, 17, 18, 19, or 20 wherein the mid-section has a length that is less than 33.3% of the length of the barrel portion.

34. (Withdrawn) A bat as in 33 wherein the mid-section has a length that is less than 25% of the length of the barrel portion.

35. (Withdrawn) A bat as in 33 wherein the mid-section has a length that is less than 16 2/3% of the length of the barrel portion.

36. (Withdrawn) A bat as in any one of Claims, 15, 16, 17, 18, 19 or 20 wherein the bat consists of polymer composite material which comprises a resin matrix encapsulating reinforcement fibers wherein the resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein the reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon fibers and mixtures thereof.

37. (Currently amended) A tubular bat with a longitudinal axis comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall with a barrel wall thickness and distinct locations including a sweet spot area within its length, and a tapered portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;
- b) a proximal end where the tapered portion connects to the handle portion;
- c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweet spot area; and
- d) two lateral regions extending on either side of the mid-section towards the distal and proximal ends respectively,

the radial stiffness of the barrel wall being greater in the mid-section of the barrel portion than in the two lateral regions of the barrel portion

wherein the barrel wall of the barrel portion consists essentially of polymer composite material containing reinforcing fibers at various angles with respect to the longitudinal axis, the reinforcing fibers present within the barrel wall of the mid-section being at a higher average angle with respect to the longitudinal axis than the average angle of the fibers within the barrel wall of the two lateral regions of the barrel portion

to provide the barrel wall with said radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion and thereby with a broadened sweet spot.

38. (Currently amended) A tubular bat with a longitudinal axis comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall with a barrel wall thickness and distinct locations including a sweet spot area within its length, and a tapered portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;
- b) a proximal end where the tapered portion connects to the handle portion;
- c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweet spot area; and
- d) two lateral regions extending on either side of the mid-section towards the distal and proximal ends respectively,

the radial stiffness of the barrel wall being greater in the mid-section of the barrel portion than in the two lateral regions of the barrel portion

wherein the barrel wall of the barrel portion consists essentially of polymer composite material which contains reinforcing fibers and the barrel wall in the mid-section contains a higher percentage of fibers than in the lateral regions

to provide the barrel wall with said radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel and a thereby with a broadened sweet spot.

39. (Currently amended) A tubular bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall a barrel wall thickness and distinct locations including a sweet spot area within its length, and a tapered portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;
- b) a proximal end where the tapered portion connects to the handle portion;
- c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweet spot area; and
- d) two lateral regions extending on either ~~sides~~ side of the mid-section towards the distal and proximal ends respectively,

the radial stiffness of the barrel wall being greater in the mid-section of the barrel portion than in the two lateral regions of the barrel portion

wherein the barrel wall of the barrel portion consists essentially of polymer composite material wherein the polymer composite material contains reinforcing fibers of types having differing stiffnesses, and the reinforcing fibers within the barrel wall of the mid-section contain a higher percentage of fibers of higher stiffness than in the lateral regions

to provide the barrel wall with said radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel and thereby with a broadened sweet spot.

40. (Withdrawn) A tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall and a sweet spot area within its length, and a tapered portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;

- b) a proximal end where the tapered portion connects to the handle portion;
 - c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweet spot area; and
 - d) two lateral regions extending on either sides of the mid-section towards the distal and proximal ends respectively,
- wherein the barrel wall of the barrel portion has a thickness and the barrel wall has a thickness in the mid-section that is greater than the thickness of the barrel wall in the lateral regions by at least 8 1/3 % whereby the radial stiffness of the barrel wall in the mid-section of the barrel portion is greater than the radial stiffness of the barrel wall in the lateral regions which is characteristic of an enlarged sweet spot.

41. (Withdrawn - Currently amended) A bat as in any one of Claims 37, 38 or 39 ~~Claim 40~~ wherein the mid-section has a length that is less than 50% of the length of the barrel portion. ~~the thickness of the mid-section of the barrel portion is greater than the thickness of the lateral regions at their thinnest parts by at least 5%.~~

42. (Partially Withdrawn - Currently amended) A bat as in any one of Claims ~~31, 32, 36,~~ 37, 38[,], or 39, ~~or 40~~ wherein the mid-section has a length that is less than ~~[[50%]]~~ 33.3% of the length of the barrel portion.

43. (Partially Withdrawn - Currently amended) A bat as in Claim 42 wherein the mid-section has a length that is less than ~~[[33.3%]]~~ 25% of the length of the barrel portion.

44. (Partially Withdrawn - Currently amended) A bat as in Claim 42 wherein the mid-section has a length that is less than ~~[[25%]]~~ 16 2/3% of the length of the barrel portion.

45. (Partially Withdrawn - Currently amended) A bat as in Claim 42 wherein the mid-section has a length that is less than ~~[[16 2/3%]]~~ 12 1/2% of the length of the barrel portion.

46 - 51 (Canceled).

52. (Withdrawn) A bat as in any one of the Claims 14, 15, 16, 17, 18, 19, 20, 33, 34, 35 or 36 wherein the region of flattened batting performance over the mid-section is at least 4 inches in length extending longitudinally along the bat.

53. (Currently amended) A tubular bat with a longitudinal axis comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion of given length for striking, the barrel portion having a barrel wall with a barrel wall thickness and distinct locations including a sweet spot area within its length, and a tapered bridging portion connecting the handle portion and the barrel portion, wherein the barrel portion has:

- a) a distal end remote from the handle;
- b) a proximal end where the tapered portion connects to the handle portion;
- c) a mid-section within the barrel portion, the mid-section being of shorter length than the length of the barrel portion and including the sweetspot area;
- d) two lateral regions extending on either side of the mid-section towards the distal and proximal ends respectively, and
- e) a radial stiffness for the barrel wall at each location along the length of the barrel portion

wherein the barrel wall thickness in the barrel mid-section that contains the sweet spot area is greater than the thickness of the barrel wall in the lateral regions and:

wherein the barrel wall of the barrel portion consists essentially of polymer composite material

~~—the thickness of the total barrel wall is at least 5% greater in the barrel mid-section than in the two lateral regions;~~

~~—the thickness of the total barrel wall is 0.005 to 0.040 inches greater in the barrel mid-section than in the two lateral regions, and~~

~~——— the area of greater thickness in the barrel mid-section is integrally formed with the barrel wall portion whereby the thickened portion is formed of the same material as the~~

~~underlying barrel wall portion without there being present a boundary therebetween
whereat different materials are in contact with each other.~~

to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion and thereby with a broadened sweet spot.

54. (Currently amended) A bat as in Claim ~~[[37]]~~ 53 wherein ~~the barrel wall thickness in the barrel mid-section is greater than the thickness of the barrel wall in the lateral regions and:~~

~~- the thickness of the total barrel wall is at least 5% greater in the barrel mid-section than in the two lateral regions.~~

~~- , and~~

~~———— the area of greater thickness in the barrel mid-section is integrally formed with the barrel wall portion whereby the thickened portion is formed of the same material as the underlying barrel wall portion without there being present a boundary therebetween
whereat different materials are in contact with each other,~~

~~to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion and thereby with a broadened sweet spot.~~

55. (Currently amended) A bat as in Claim ~~[[38]]~~ 54 wherein ~~the barrel wall thickness in the barrel mid-section is greater than the thickness of the barrel wall in the lateral regions and:~~

~~- the thickness of the total barrel wall is 0.005 to 0.040 inches greater in the barrel mid-section than in the two lateral regions, and,~~

~~———— the area of greater thickness in the barrel mid-section is integrally formed with the barrel wall portion whereby the thickened portion is formed of the same material as the~~

~~underlying barrel wall portion without there being present a boundary therebetween whereat different materials are in contact with each other,~~

~~to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion and thereby with a broadened sweet spot.~~

56. (Currently amended) A bat as in Claim [[39]] 55 ~~wherein the barrel wall thickness in the barrel mid-section is greater than the thickness of the barrel wall in the lateral regions and:~~

~~- the thickness of the total barrel wall is 0.005 to 0.040 inches greater in the barrel mid-section than in the two lateral regions, and~~

~~- the area of greater thickness in the barrel mid-section is integrally formed with the barrel wall portion whereby the thickened portion is formed of the same material as the underlying barrel wall portion without there being present a boundary therebetween. ~~whereat different materials are in contact with each other,~~~~

~~to provide the barrel wall with a radial stiffness in the mid-section that is greater than the radial stiffness of the barrel wall within the two lateral regions of the barrel portion and thereby with a broadened sweet spot.~~

57 - 59 (Canceled)

60. (Currently amended) A bat as in any one of Claims 53, 54, 55 or 56 ~~Claim 57~~ wherein the increased thickness of the barrel wall in the barrel mid-section is the only part of the barrel portion that is of increased thickness over the thickness of the barrel wall in the lateral regions.

61. (Currently amended) A bat as in any one of Claims 53, 54, 55 or 56 ~~Claim 57~~ wherein the barrel mid-section of increased thickness is centered around the middle of the barrel.

62. (Currently amended) A bat as in any one of Claims 37, 38, 39, 53, 54, 55 or 56 ~~Claim 57~~ wherein the lateral regions start 1" to 3" from the center of the mid-section and extend towards the proximal and distal barrel ends

63. (Currently amended) A bat as in any one of Claims 53, 54, 55 or 56 ~~Claim 57~~ wherein the mid-section has a length that is less than $[[33.3]]$ 50% of the length of the barrel portion.

64. (Currently amended) A bat as in Claim ~~57~~ 63 wherein the mid-section has a length that is less than $[[25]]$ 33.3% of the length of the barrel portion.

65. (Currently amended) A bat as in Claim ~~57~~ 63 wherein the mid-section has a length that is less than $[[16\ 2/3]]$ 25% of the length of the barrel portion.

66. (Currently amended) A bat as in Claim ~~57~~ 63 wherein the mid-section has a length that is less than $[[12\ 1/2]]$ 16 2/3% of the length of the barrel portion.

67. (Previously presented) A bat as in any one of Claims 37, 38, 39, 53, 54, 55 or 56 ~~Claim 57~~ wherein the bat is a single wall bat.

68. (Previously presented) A bat as in any one of Claims 37, 38, 39, 53, 54, 55 or 56 ~~Claim 57~~ wherein the bat is a multi-wall bat, which includes a double wall bat.

69. (Previously presented) A bat as in any one of Claims 53, 54, 55 or 56 ~~Claim 57~~ wherein the barrel wall thickness on either side of the barrel mid-section that contains the sweet spot area is graduated towards a decreasing thickness within the lateral regions.

70 - 71 (Canceled)

72. (New) A bat as in Claim 60 wherein the mid-section has a length that is less than $12\ 1/2\%$ of the length of the barrel portion.

I CLAIM:

1. A tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle portion and said barrel portion, wherein said barrel portion has variable stiffness along its length.
2. A bat according to claim 1, wherein said variable stiffness is achieved by adding a polymer composite material stiffener to the said barrel portion.
3. A bat according to claim 2 wherein said polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.
4. A bat according to claim 2 wherein said stiffener has a length less than 50% of the said barrel portion length and adds less than 2 oz. to said bat weight.
5. A bat according to claim 2 wherein said stiffener is located internally, and/or externally to said barrel portion, and/or between members of double-walled or multi-walled bats, or combinations thereof.
6. A bat according to claim 2 wherein said stiffener is bonded full length to at least one bat barrel member.
7. A bat according to claim 1, where said stiffness is radial stiffness.
8. ***A polymer composite tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle portion and said barrel portion, wherein said barrel portion is radially stiffer in the middle of the said barrel portion and circumferentially less stiff radially in the two end portions of the said barrel portion.***

9. A bat according to claim 8 wherein said polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.

10. A polymer composite baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle and barrel portion, wherein the radial stiffness of said barrel portion is highest in the said barrel portion's middle area, lowest at the ends of the said barrel portion, and generally uniformly changes from the middle portion to each end portion of said barrel portion.

11. A bat according to claim 10 wherein a polymer composite material comprises a resin matrix encapsulating reinforcement fibers wherein said resin is selected from the group of resin consisting of epoxy, vinyl ester, polyester, urethane, nylon, and mixtures thereof and wherein said reinforcement fibers are selected from the group consisting fiberglass, graphite, carbon, aramid, boron, nylon and mixtures thereof.

12. A tubular baseball bat comprising a cylindrical handle portion for gripping, a cylindrical tubular barrel portion for striking, and a tapered mid-section connecting said handle and barrel portion, wherein said barrel portion's thickness varies over said barrel portion's length.

13. A bat according to claim 12 wherein said barrel portion's thickness is at least 5% thinner, at either or both end portions of said barrel portion, than the central portion of said barrel portion.